Space Weather Technical Forecast

Issued on Wednesday 15 January 2025 at 13:07 Local

This technical forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

---

Space Weather Forecast Headline: Chance of isolated M-class flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Low with peak flare C6.3 at 15/0856 UTC from AR3961. There are seven sunspot regions. The largest is AR3959 in the northeast, comprised of a large leader spot with a much smaller trailer region. AR3961 in the southeast has shown some growth in its intermediate spots but is otherwise a relatively simple bipolar group. The other regions are relatively small and simple, however AR3962 has the potential for more complexity to become evident as this moves onto the Earth-facing disc.

No Earth-bound CMEs were observed.

Solar Wind / Geomagnetic Activity: Ongoing fast wind influence was observed from CH08/-. Solar wind speeds were mainly elevated, between 450-500 km/s, with brief peaks towards 550km/s. Density was around average. Interplanetary Magnetic Field, Bt, was mostly Weak, but rose to Moderate at the end of the period, ranging 2-9nT. The north-south component, Bz, was weak, ranging between +/- 8nT. Phi angle was negative (towards the Sun). Geomagnetic activity was Quiet to Unsettled (Kp1-3) with two Active (Kp4) intervals 15/0300-0900 UTC.

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10MeV) at GOES-18 was Background. High energy electron flux (greater than 2MeV) at GOES16 was Background to Moderate with the associated 24 hour fluence below the Active threshold. This reached 7.32e6 integrated pfu at 15/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate with a chance of isolated M-class flares.

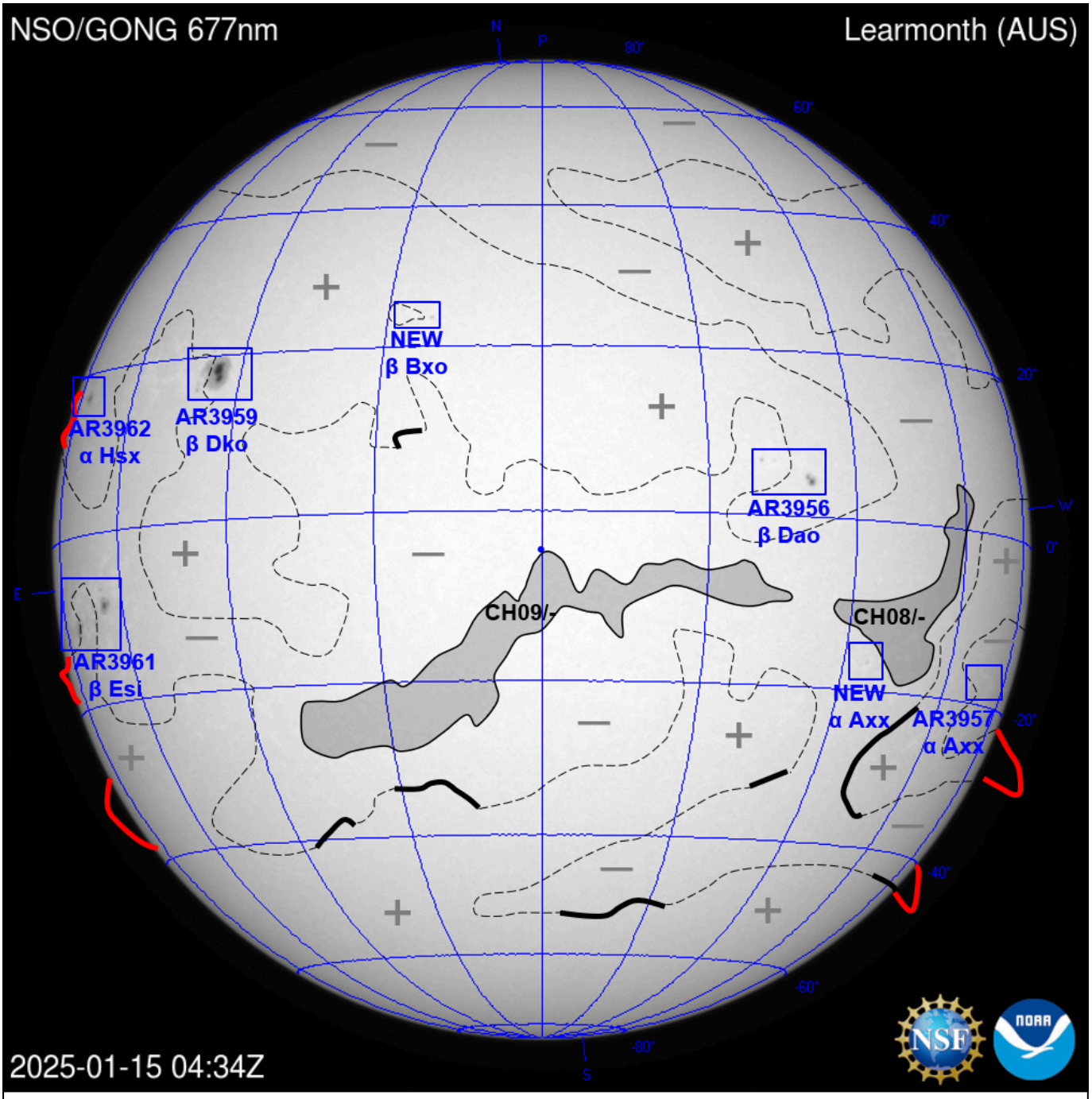
Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs. Ongoing coronal hole influence is expected, with a transition from the fast wind of CH08/- to CH09/-, and likely persisting for much of the period. Slightly elevated to elevated solar winds forecast, perhaps peaking day 3-4. Mainly Quiet to Unsettled geomagnetic activity is expected with a chance of Active intervals on all days. There is a slight chance of reaching a G1 Minor Storm interval, perhaps slightly higher by days 3-4 (17-18 Jan).

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

Energetic Particles / Solar Radiation: GOES18 high energy proton flux is expected to remain at background. GOES-16 high-energy electron flux is anticipated to be at background with diurnal Moderate peaks, perhaps rising to High by the end of the period. The associated 24 hr fluence is expected to persist below Active (1e8 integrated pfu).

Figure 1: MOSWOC Solar Synoptic Map 15/0800 UTC



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

Geomagnetic Storms

There are no Earth-directed CMEs

The solar wind forecast is dominated by the broad coronal hole across the central southern disc CH09/-, and extending into the current connected feature CH08/- which is now becoming hard to observed on the western disc. Due to these extended features ongoing fast wind influence is possible through the period, with slightly elevated (400-500km/s) solar winds are expected, perhaps strengthening to be elevated (500-600km/s) day 3-4 (17-18 Jan), as Earth moves into the better defined and darker region of CH09.

This ongoing feature is supported in MOSWOC Enlil, although this is perhaps over-estimating the longevity of the feature.

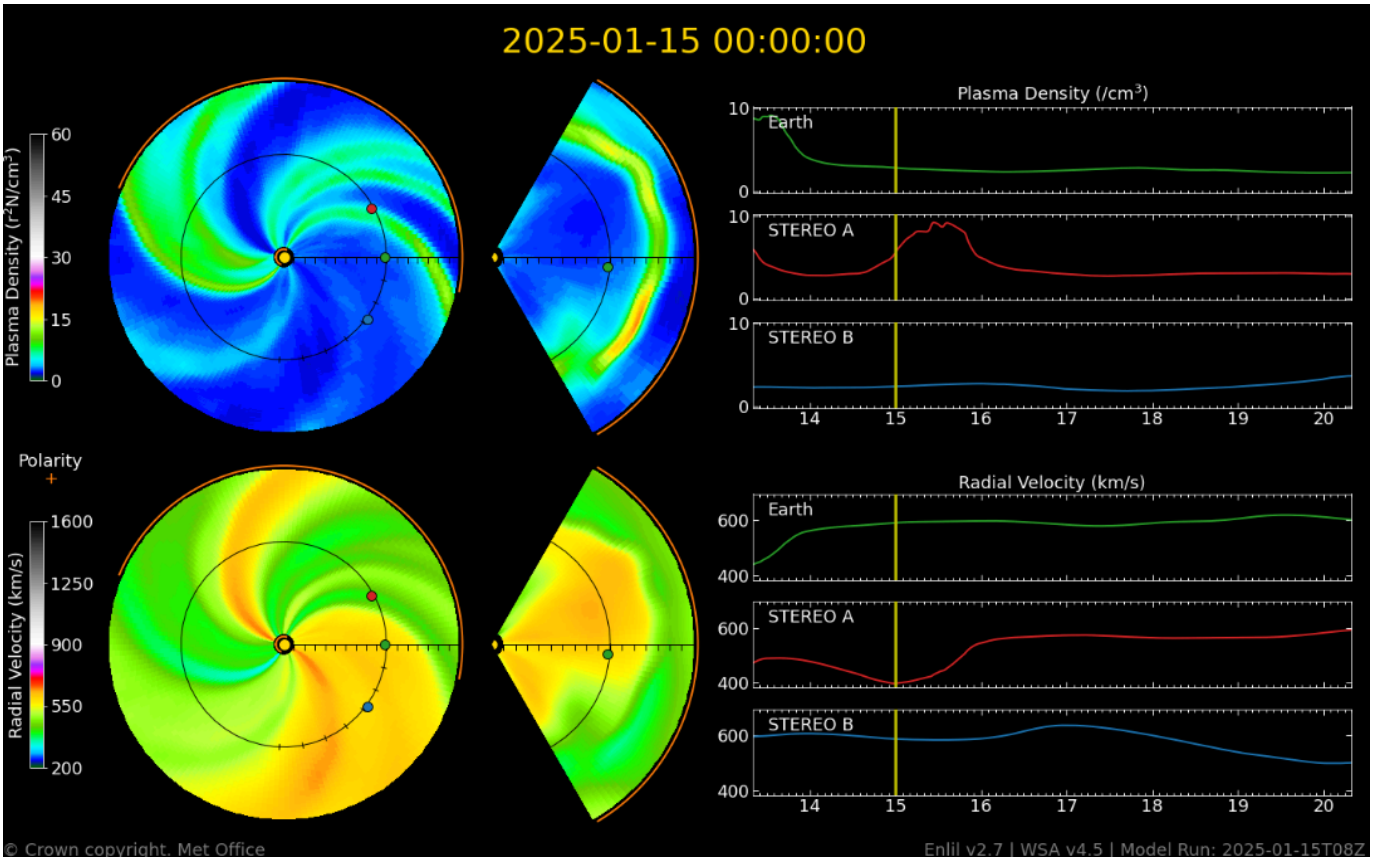
Overall Quiet to Unsettled conditions are expected with a chance of Active intervals on all days. There is a slight chance of reaching a G1 Minor Storm interval, perhaps slightly higher by days 3-4 (17-18 Jan).

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	5	10	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

Figure 2: MOSWOC Enlil showing broad CH enhancement. Likely overdone, but still indicative of the potential longevity of any enhancement.



© Crown Copyright 2025. All Rights Reserved.

Radio Blackouts - X-Ray Flares

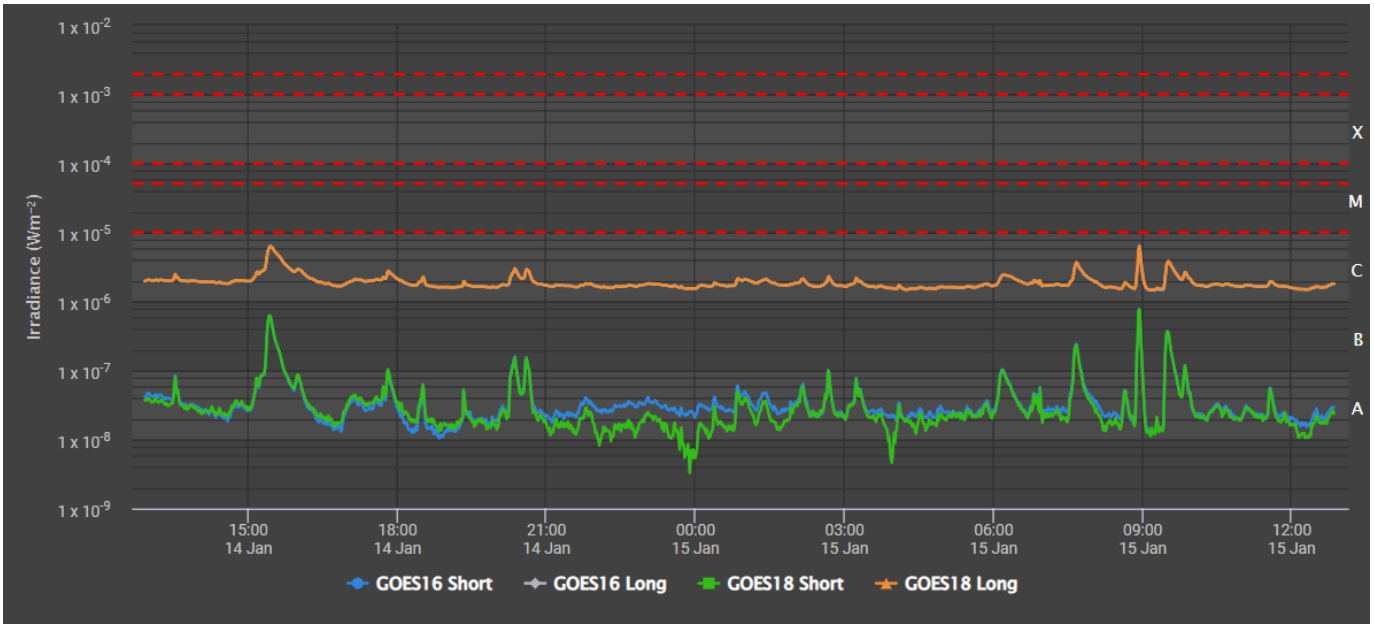
Low activity is likely to continue, but with an increasing likelihood of rising to Moderate due to isolated M-class flares. The most likely sources are currently on the eastern limb, including large AR3959 and the smaller AR3961 which has some apparent development.

AR3959 is primarily comprised of a large leader spot with a small trailer, however this has recently developed a weak umbra-penumbra structure suggestion some complexity and potential for further growth. AR3961, while currently appearing to be a relatively simple E-W aligned bipolar group has also seen the apparent emergence of intermediate spots as it rotates to a less oblique viewing angle.

Further complexity is also possible from AR3962 as it rotates into a clearer view, currently appearing to be a small unipolar spot, but with the potential for a trailer region to become visible on the eastern limb. The other regions remain small and simpler, however further activity cannot be completely ruled out from over the eastern limb.

X-Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 (M Class)	No	40	50	60	60
Very Active	R3-R5 (X Class)	No	5	5	5	5

Figure 3: GOES 16/18 X-ray Irradiance



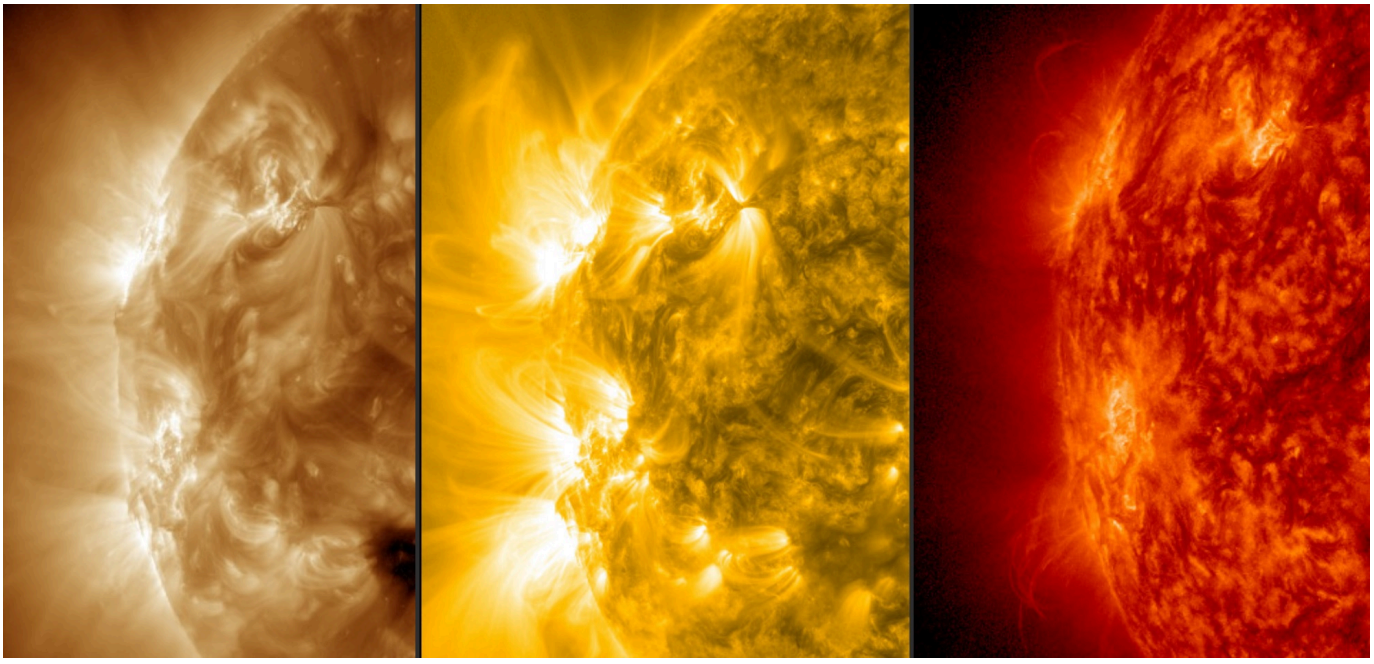
© Crown Copyright 2025. All Rights Reserved.

Solar Radiation Storms (High Energy Protons)

GOES18 high energy proton flux has remained at background over the last 24 hours and is expected to persist at this level. The main complexity on the disc is currently on the eastern disc, which is a less likely source location for proton events to be observed at Earth.

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

Figure 4: SDO aia imagery showing the majority of the activity, which is on the eastern disc.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

High Energy Electrons (≥ 2MeV)

High energy electron flux observed at GOES16 has been at normal to moderate levels during the past 24 hours. Ongoing coronal hole influences are likely to likely to lead to some charging of the Van Allen belts, but potentially result in the majority of this charge persisting below GEO. Ongoing periods of Moderate flux are likely at diurnal peak, perhaps approaching High day 3-4 (17-18 Jan), depending upon the timing of the onset of any stronger fast winds from CH09.

Overall, fluence is forecast to remain below Active, but may see a rising trend later in the period. This is hinted at with REFM and 27-day Recurrence, however these are both potentially underdoing the likely rise.

GEO Electron Environment	Level ($cm^{-2}sr^{-1}$ day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ 1×10^{8}	No	1	1	1	5
Very Active	≥ 2 MeV ≥ 1×10^{9}	No	1	1	1	1

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

Figure 5: GOES 16 >2MeV Electron flux (top) and Fluence with REFM and Recurrence (bottom)

© Crown Copyright 2025. All Rights Reserved.